What makes a good boot?

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Introduction

- Background to EPRG & D&T
- Human Factors context for decision making: Contextual model of layered interface of footwear
- Extremities PPE Requirements
- Issues within future footwear design

E P R G

- The Extremities Performance Research Group contributes towards a better understanding of the complex interaction between the extremities and an object during a task performance.
- Theoretical models of hand and object interaction provide a contextual framework for the measurements taken.
- Specifically, the group develops methods for measuring aspects of that interaction.
- 10 years experience relating to hand performance, with a further 4 years involved with extremities.

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Current Issues

- Discomfort
  - Blistering
  - Moisture accumulation
  - Lack of support
- Usability
  - Donning and doffing
- Fit
  - Correct size for the person

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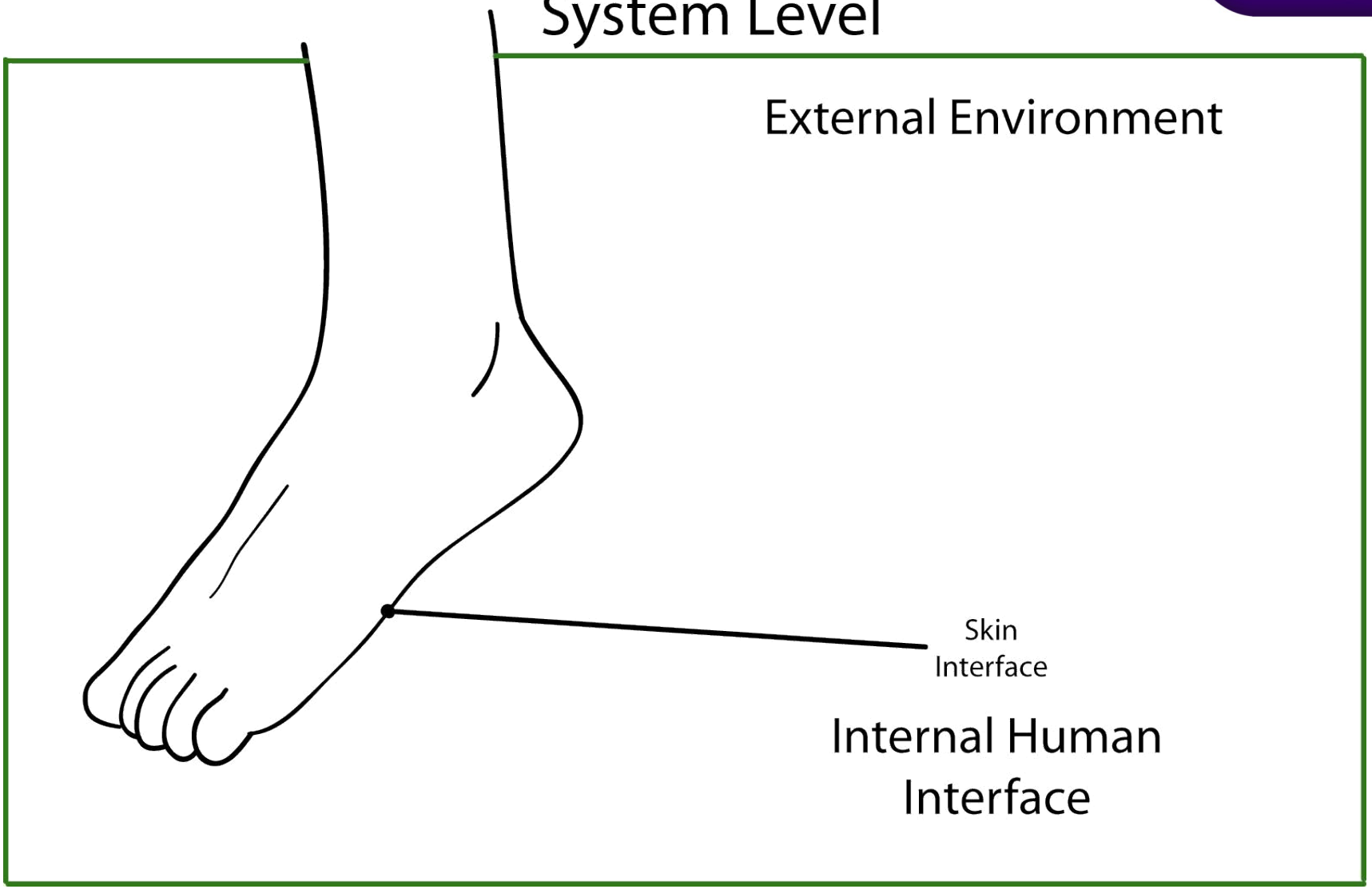
System Level



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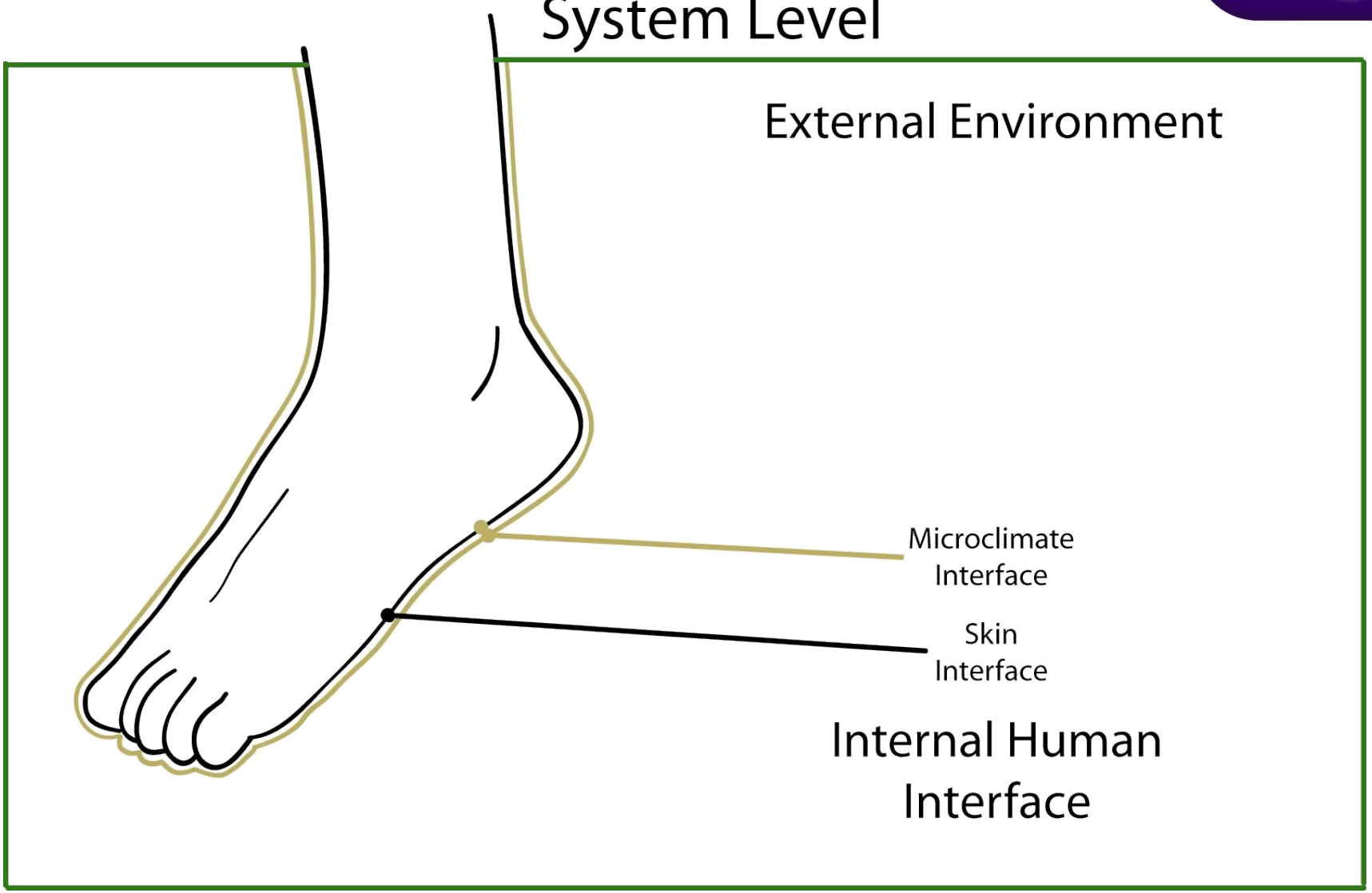

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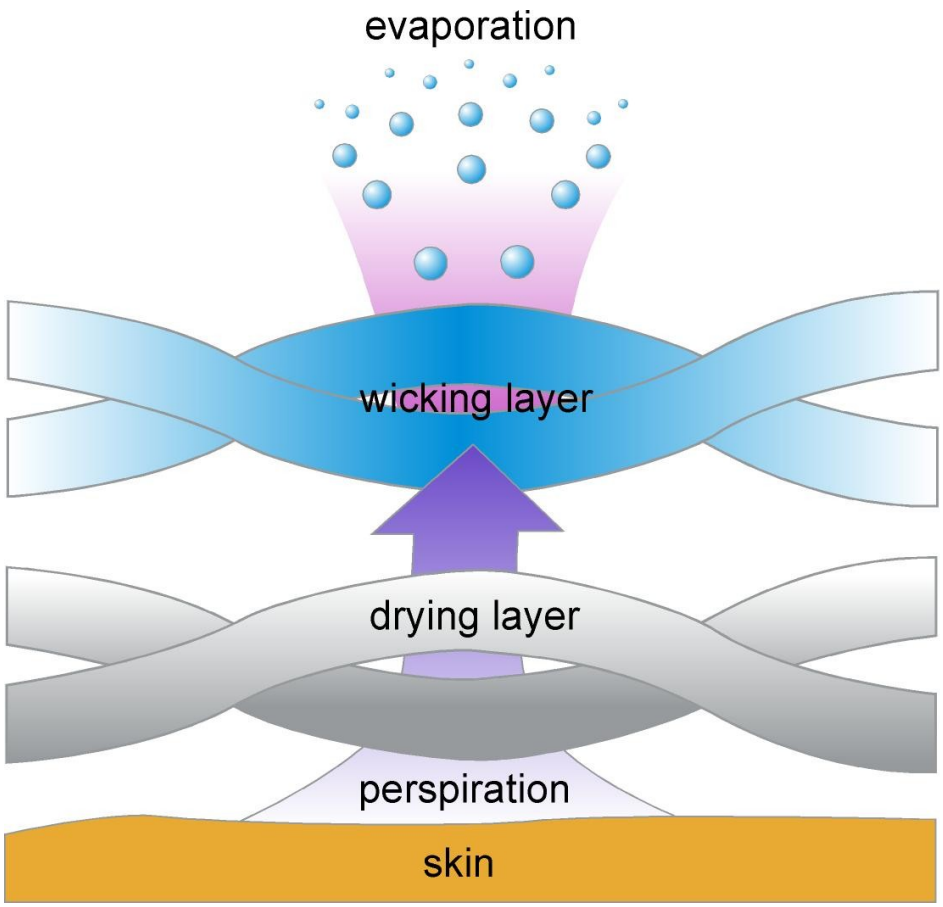
Sweat Management

- Environment
  - Requirements change depending on the type of environment
  - Optimise thermal properties

Sweat Management



- Fabrics
  - Wicking
  - Sweat Permeable
  - Thermal Insulation

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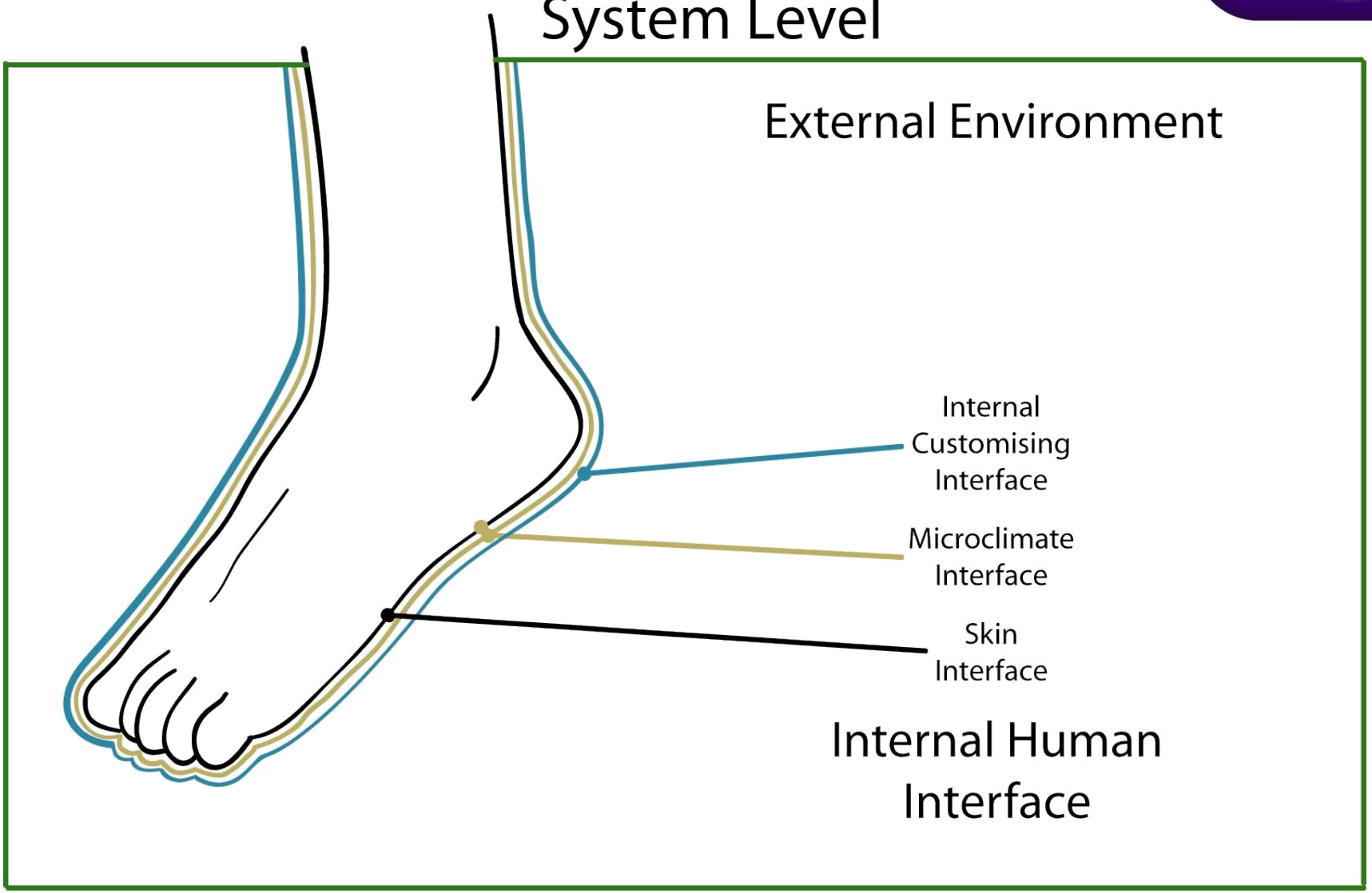
Sweat Management

- Environment
  - Requirements change depending on the type of environment
  - Optimise thermal properties
  - Improve sweat migration
  - Wicking
  - Maintain skin quality by preserving a dry layer

System Level



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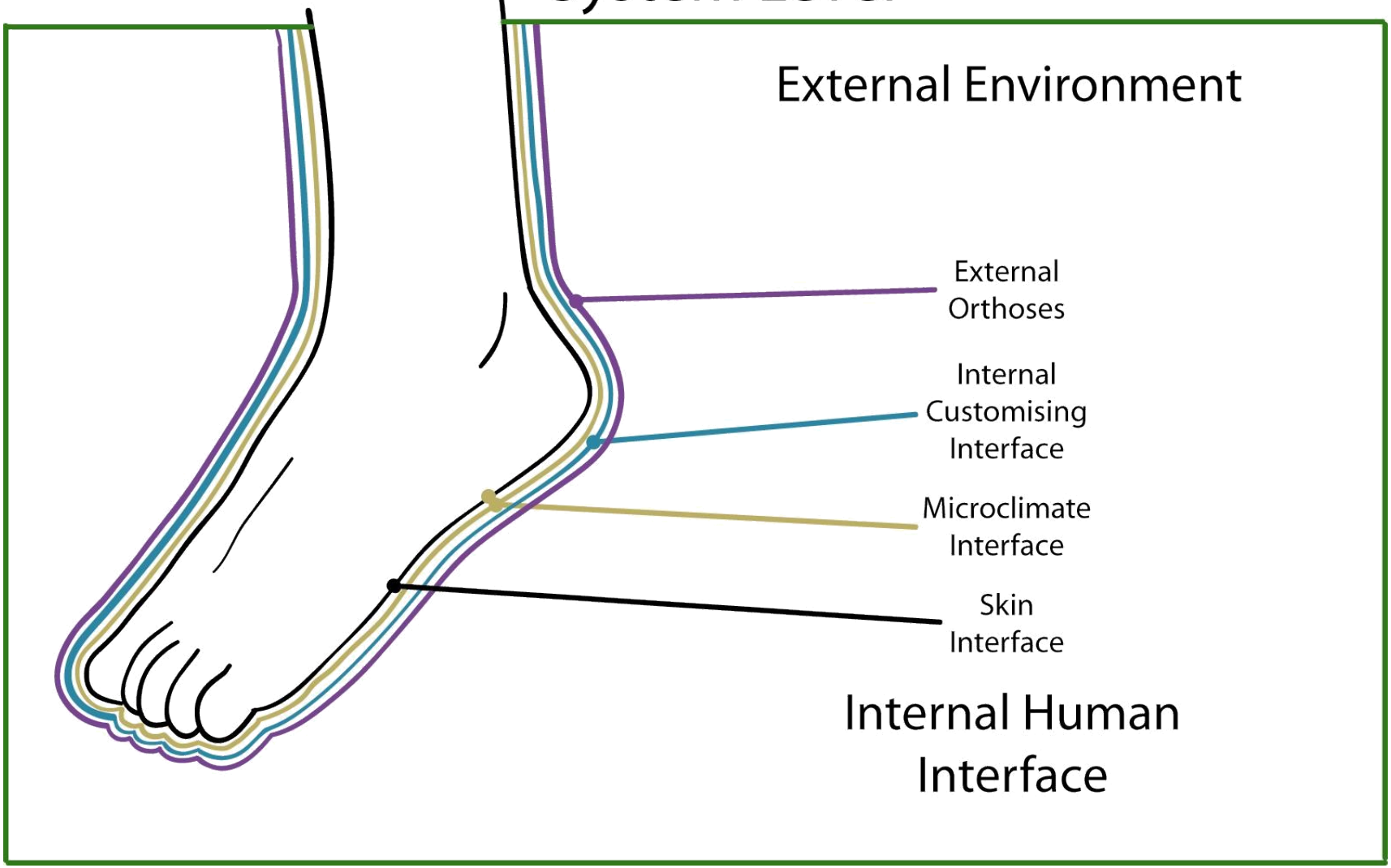

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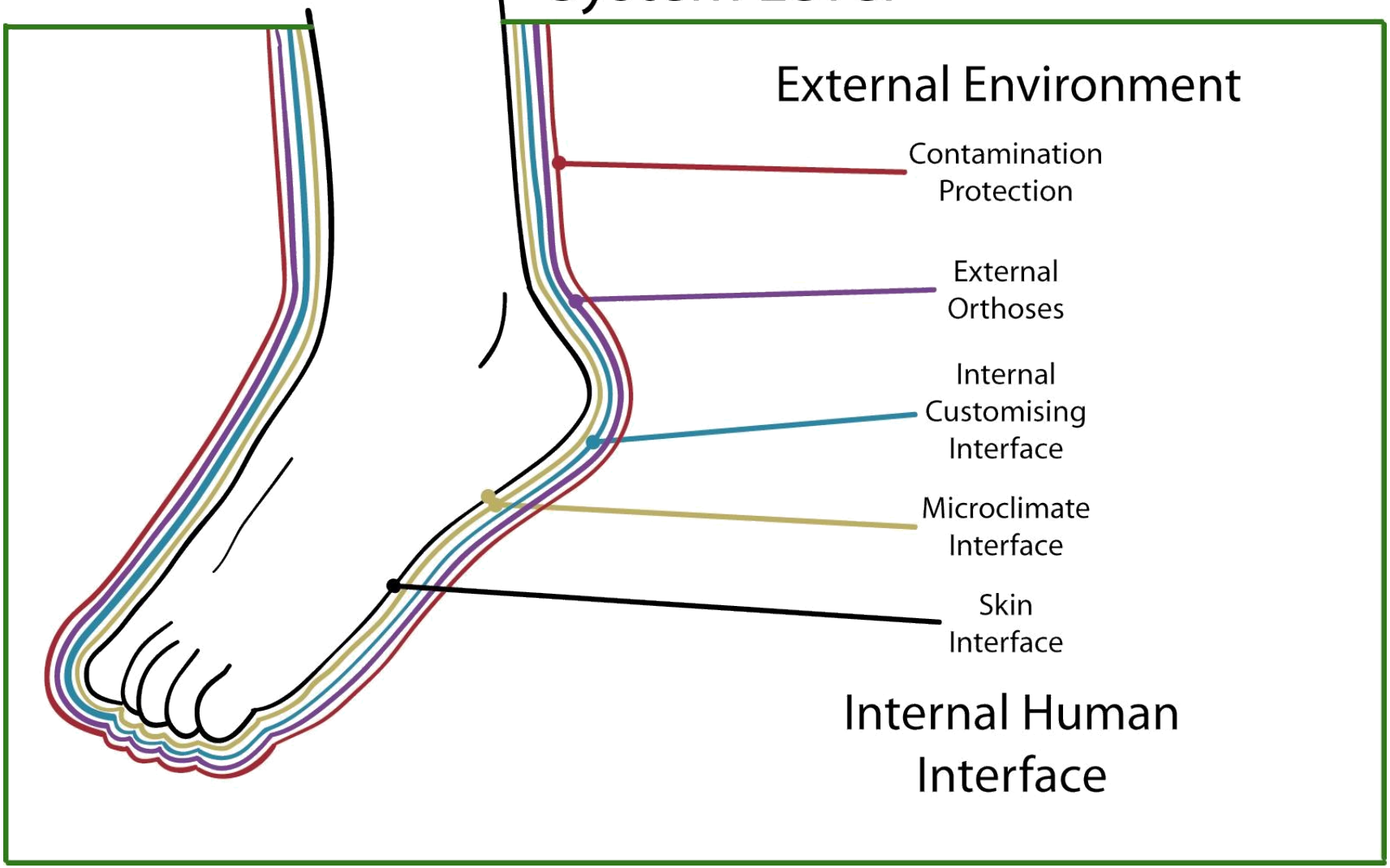

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Footwear Requirements

- Thermal protection in temperate climates
- Distribute application of pressure from external orthoses through to skeletal structure appropriate to the area supported
- Keep the skin dry (i.e. remove moisture from the skin/glove interface)

Footwear Requirements

- Be quick drying
- Easy to maintain
- Allow quick and easy donning and doffing
- Be of good fit (specifically between footwear and other clothing)

Fit

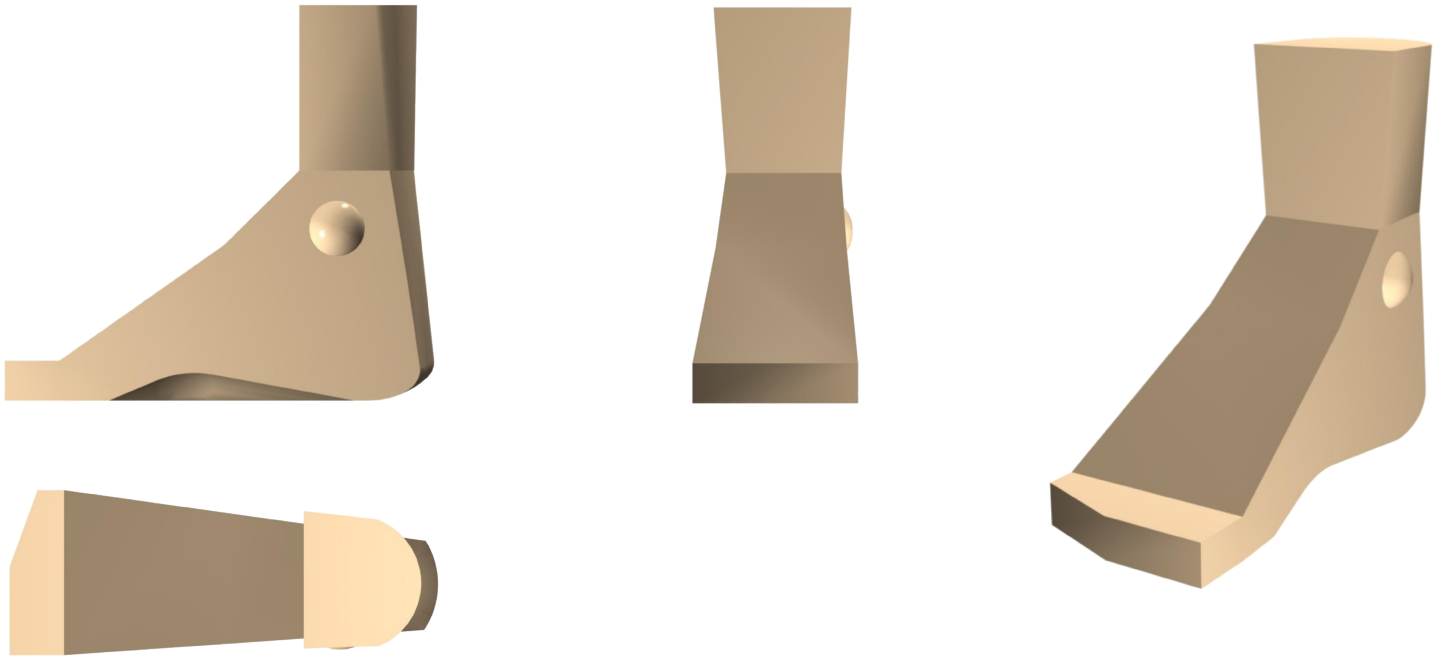
- Poor fit leads to:
  - Loss in dexterity
  - Reduction of comfort
  - Increased energy cost
  - Extreme sizes not catered for
  - Critical for task performance

Fit

- Improved knowledge of foot anthropometry

Fit

- Improved knowledge of foot anthropometry
- Better quantification of size ranges



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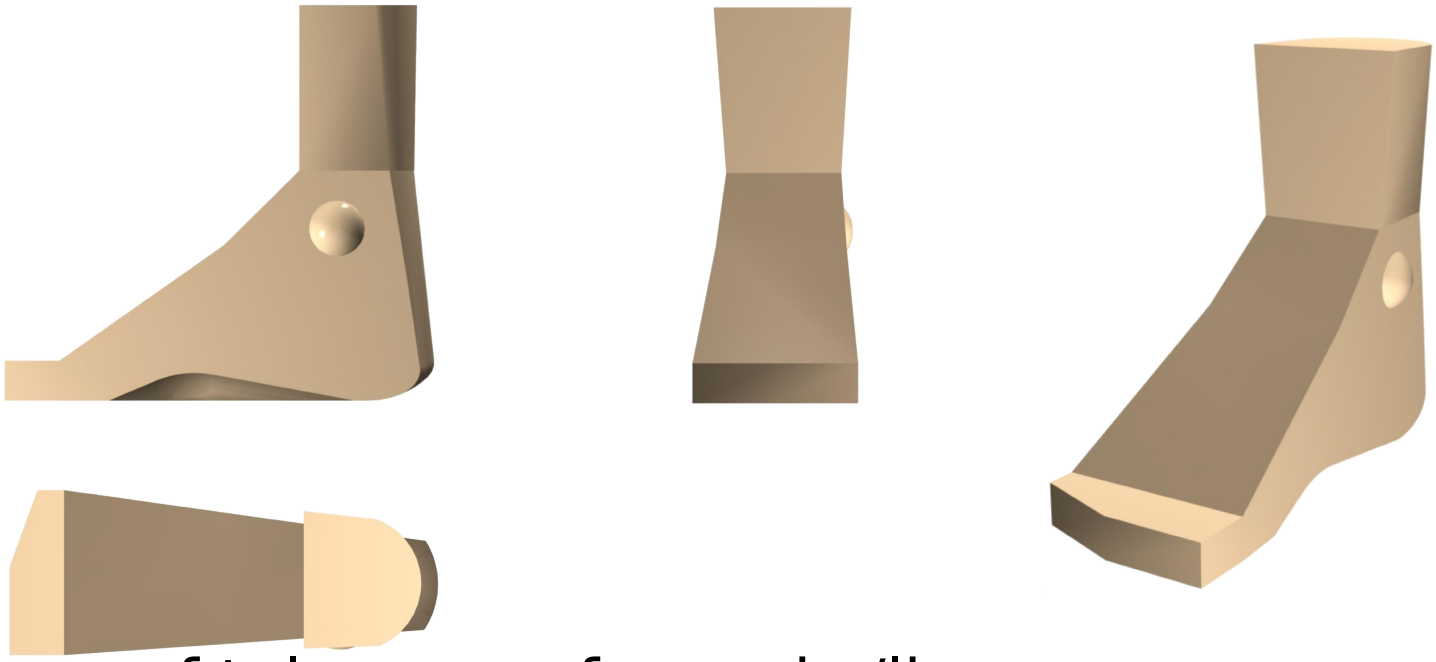
Fit

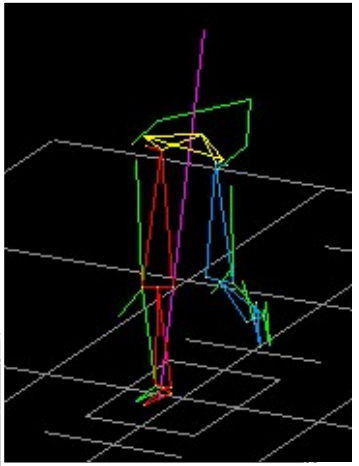
- Improved knowledge of foot anthropometry
- Better quantification of size ranges

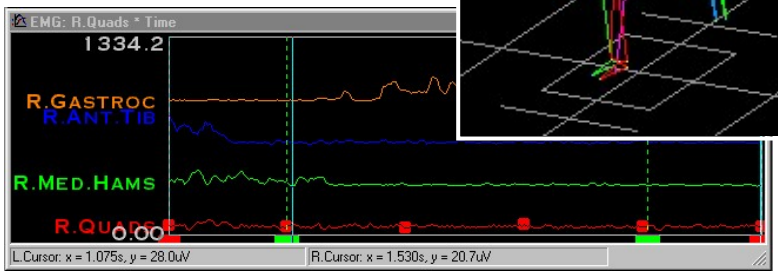


- Issues of tolerances for socks/liners

Evaluation

- Testing and evaluating materials / boots
- Objective assessment
- Subjective assessment





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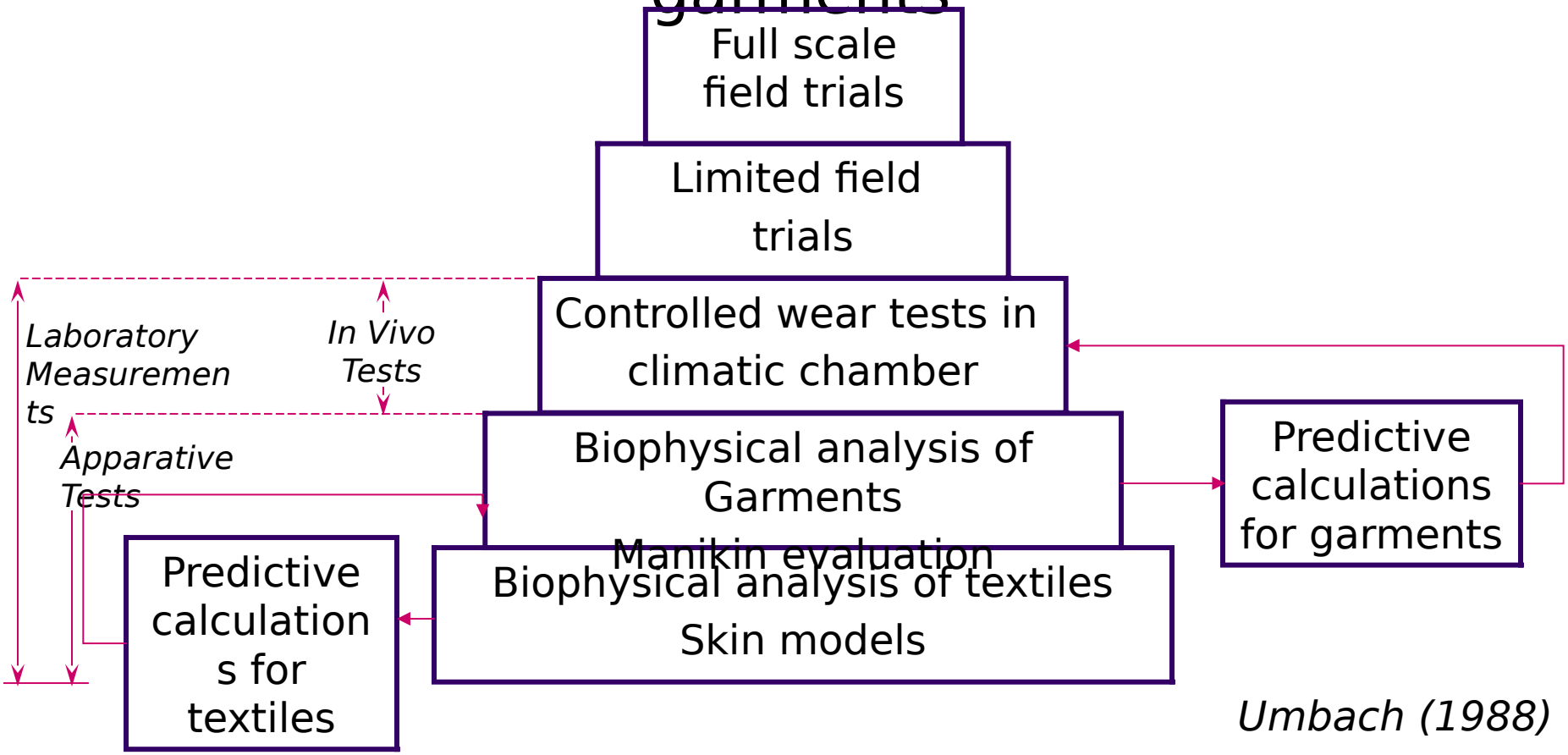
5 level system for the analysis of the physiological properties of textiles and garments



Umbach (1988)

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Areas for Development

- Range of Motion
  - Allow full range of motion of all joints, but prevent over extension and flexion
- Usability
  - Donning and doffing, lacing systems
  - Hygiene
- Protection
  - Impact, abrasion
  - Thermal, chemical, flame

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Conclusions

- A complex problem – solutions often in conflict
- Improve the microclimate of the boot
- Improved evaluation of user perceptions of fit/comfort in the boot
- Ultimately aim to improve performance

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